

a turret including a plurality of transfer arms continuously rotating about a single vertical axis;

a plurality of pickup heads carried by said transfer arms rotating in a main radial path for picking up the articles at said pickup station and depositing the articles successively into said cases;

a plurality of grid heads having pivoting grid fingers arranged in a grid array corresponding to an array of the articles to be picked up, said grid fingers defining grid chutes having upper ends and lower ends for receiving the articles; said grid heads being carried by said transfer arms in alignment with said pickup heads;

said pickup heads having an array of article gripper elements corresponding to the array of grid chutes and the articles for gripping the articles;

a pickup head actuator mechanism for actuating said gripper elements to selectively grip and release the articles;

a motion converter operatively connected between said pickup heads and grid heads and said rotating turret causing said pickup and grid heads to swivel about a secondary swivel axis through said pickup station causing said pickup and grid heads to depart from said main radial path and move along a straight-line path through said pickup station parallel to the linear article path for reliable article pick up, and said pickup and grid heads returning to the main radial path after passing through the pickup station and moving along the main radial path without swiveling.

a vertical motion mechanism for controlling relative vertical positions of said pickup and grid heads during transfer of the articles between said pickup and release stations as said turret rotates continuously about said vertical axis.

Claim 77 (new). The apparatus of claim 76 wherein said motion converter maintains the direction of said pickup and grid heads generally constant along said main radial path.

Claim 78 (new). The apparatus of claim 77 including case indexes carried by said case conveyor indexing and transporting said cases on said conveyor in a generally stationary position relative to said common transport surface so that the orientation of the cases and said heads remain generally constant during movement along said main radial path.

Claim 79 (new). The apparatus of claim 76 wherein said motion converter includes articulating connector mechanisms operatively connected to said pickup and grid heads swiveling said pickup and grid heads in a first direction at the beginning of said straight-line path causing said heads to depart from said radial path at said pickup station at the beginning of said straight-line path, swiveling said heads in an opposite, second direction at the end of said straight-line path causing said heads to return to said radial path, and swiveling said heads between the beginning and the end of said straight-line path to effect said straight-line path.

Claim 80 (new). The apparatus of claim 79 wherein said motion converter includes support frames carried by said turret, said pickup heads being slidably carried by said support frames to rotate about said secondary swivel axis during said swiveling whereby said pickup heads maintain said straight-line motion through said pickup station.

Claim 81 (new). The apparatus of claim 80 wherein said connector mechanism is constructed and arranged to move said pickup heads in a rotary and a

translatory motion when said pickup and grid heads swivel about said second swivel axis.

Claim 82 (new). The apparatus of claim 81 wherein said connector mechanism includes a first articulating linkage arrangement connected near one side of said pickup and grid heads and a second articulating linkage arrangement connected near another side of said pickup and grid heads for effecting movement of said pickup and grid heads in said straight-line path.

Claim 83 (new). The apparatus of claim 82 including at least one fixed cam carried by a stationary support, and cam followers carried by said first and second articulating linkage arrangements engaged with said cam for imparting said movement to said pickup and grid heads.

Claim 84 (new). The apparatus of claim 83 wherein said first and second linkage arrangements include respective first and second vertical rotary cam shafts connected to said cam followers, and upper and lower arm links are slidably carried by said first and second rotary cam shafts connected to said pickup and grid heads for articulating said heads about said secondary swivel axis as said cam shafts rotate.

Claim 85 (new). The apparatus of claim 76 wherein said pickup head actuator mechanism includes an engagement member carried at said release station, and operators carried by said pickup heads which strike said engagement member at said release station whereby said operators are moved to a release position for releasing the articles.

Claim 86 (new). The apparatus of claim 85 including a latch operatively associated with said pickup heads for latching said operators in said release position,

and an unlatching device carried at said pickup station for releasing said latch so that said pickup heads grip the articles.

Claim 87 (new). The apparatus of claim 86 including a second engagement member carried at said pickup station for urging said operator downward to remove pressure from said latch to aid said unlatching device in releasing said latch whereby said gripper elements grip the articles for pickup, and said first and second engagement members are carried in a fixed relationship by said turret.

Claim 88 (new). The apparatus of claim 76 including a stationary support about which said turret rotates; and wherein said vertical motion mechanism includes first and second cams generally encircling said stationary support, a first cam roller associated with each said pickup head which rides on said first cam and a second cam roller associated with each said grid head which rides on said second cam whereby the vertical positions of said pickup and grid heads are controlled.

Claim 89 (new). The apparatus of claim 88 wherein said vertical motion mechanism includes guide bearings slidably supporting said pickup and grid heads on said transfer arms, and said first and second cam rollers being carried by said guide bearings.

Claim 90 (new). Apparatus for transferring articles from a pickup station to a release station in a continuous motion, said apparatus being of the type which includes a plurality of reciprocating pickup heads for picking up the articles at said pickup station and releasing the articles at said release station, and a vertical motion mechanism for moving said pickup heads to operative positions relative to the articles at said pickup and release stations, wherein said apparatus comprises:

an article conveyor for conveying articles to the pickup station;

a case conveyor for transporting a plurality of cases on a common transport surface;

a rotating turret which continuously rotates about a substantially vertical turret axis for continuously transferring the articles;

a plurality of reciprocating pickup heads carried by said turret for movement along a main radial path for continuously and successively picking up groups of the articles at said pickup station and releasing the articles at said release station;

a pickup-head motion converter associated with said turret and operatively connected to said pickup heads, said motion converter having a first position causing said pickup heads to swivel about a secondary swivel axis and depart from said radial path and continue to swivel to move generally in a straight-line path through the pickup station while picking up the articles; and

said motion converter having a second position causing said pickup heads to swivel about the secondary swivel axis and return to said main radial path after passing through the pickup station and move along said main radial path without swiveling.

Claim 91 (new). The apparatus of claim 90 wherein said case conveyor has an arcuate shape with a curvature generally corresponding to the curvature of the main radial path of said pickup heads.

Claim 92 (new). The apparatus of claim 90 wherein said pickup-head motion converter includes articulating connector mechanisms swiveling said pickup heads in said first and second positions, and connector mechanism swiveling said pickup heads

in intermediate positions between said first and second positions to effect said straight-line path.

Claim 93 (new). The apparatus of claim 92 wherein said motion converter includes support frames carried by said turret, said pickup heads being slidably carried by said support frames to rotate about said secondary swivel axis through said pickup station and maintain said straight-line motion through said pickup station.

Claim 94 (new). The apparatus of claim 93 wherein said articulating connector mechanisms are constructed and arranged to move said pickup heads in a rotary and a translatory motion when said pickup heads swivel about said secondary axis on said frames.

Claim 95 (new). The apparatus of claim 94 wherein said articulating mechanisms include vertical cam shafts carried by said turret, articulating linkage arrangements connected between said cam shafts and said pickup heads for imparting said motion to said pickup heads; and said linkage arrangements being slidably carried by said cam shafts to slide up and down as said pickup heads reciprocate vertically during pick up and release of the articles.

Claim 96 (new). The apparatus of claim 95 including a stationary support about which said turret rotates; cam followers connected to said articulating linkage arrangements, and at least one cam carried by said stationary support which said cam followers follow to impart said straight-line motion to said pickup heads.

Claim 97 (new). The apparatus of claim 90 wherein said case conveyor includes a plurality of case indexes carried on said conveyor, said cases being indexed

and transported on said common transport surface without a change in case orientation on said transport surface.

Claim 98 (new). The apparatus of claim 97 including a plurality of transfer arms carried by said turret; said pickup heads being slidably carried by said transfer arms; a plurality of grid heads slidably carried by said transfer arms having pivoting grid fingers arranged in a grid array corresponding to an array of the articles to be picked up, said grid fingers defining grid chutes having upper ends and lower ends for receiving the articles; said grid heads being slidably carried by said transfer arms below said pickup heads; and said pickup heads having an array of article gripper elements arranged in a matrix corresponding to the array of grid chutes for gripping the articles.

Claim 99 (new). The apparatus of claim 98 wherein said grid chutes have an open chute position wherein said lower chute ends are open for receiving the articles, said vertical motion mechanism is operatively connected to said grid heads for lowering said grid heads relative to said transfer arms over the articles in said open chute position; said grid fingers having a closed position with the articles being held generally in said chutes, and including a grid actuator operatively associated with said grid fingers to cause said grid fingers to move between said open and said closed positions.

Claim 100 (new). The apparatus of claim 99 wherein said vertical motion mechanism controls vertical positions of the pickup and grid heads on the transfer arms including circular cams carried around a stationary support disposed centrally of said turret; and cam rollers associated with said heads which ride on said cams, said cam rollers being interconnected to control the vertical position of said pickup and grid heads.

Claim 101 (new). The apparatus of claim 100 wherein said vertical motion mechanism includes guide bearings slidably supporting said pickup and grid heads on said transfer arms, and said cam rollers being carried by said guide bearings.

Claim 102 (new). A continuous circular motion apparatus for transferring groups of articles arranged in parallel rows from a pickup station to a release station comprising:

an article conveyor for conveying successive groups of articles along a linear path at said pickup station;

a case conveyor for transporting a plurality of cases on a common transport surface generally without change in orientation on said transport surface, along a case transport path;

a rotating turret which continuously rotates about a single vertical turret axis;

a plurality of reciprocating pickup heads carried by said turret in a circular arrangement for continuously and successively engaging said groups of articles on said conveyor, and said turret rotating said pickup heads along a main radial path coinciding with said case transport path wherein the orientation of said pickup heads remain generally constant along the main radial path; and,

a pickup-head motion converter operatively connected to said pickup heads causing said pickup heads to swivel about a secondary swivel axis through said pickup station to effect movement of said pickup heads in a straight-line path through the pickup station coinciding with said linear article path during article pickup, and causing said pickup heads to swivel and return to said radial path after passing through said

pickup station and move without swiveling along said main radial path;

whereby the orientation of said pickup heads relative to said turret and the orientation of cases relative to said common transport surfaces is constant moving along said main radial path while the pickup heads change their orientation relative to the turret passing through the pickup station.

Claim 103 (new). The apparatus of claim 102 wherein said turret includes support arms circularly arranged about said turret; and said motion converter includes:

support frames carried by said support arms, and said pickup heads being carried by said support frames so that said pickup heads swivel about a secondary swivel axis relative to said support frames as said pickup heads move in a straight-line through the pick-up station; and

connector mechanisms interconnected between said turret and said pickup heads for imparting the swivel motion to said pickup heads on said frames causing said pickup heads to move in said straight-line path through the pickup station.

Claim 104 (new). The apparatus of claim 103 including a vertical motion mechanism operatively associated with said pickup heads for controlling operative vertical positions of said pickup heads to engage said articles on said article conveyor at an engagement station, and to disengage from said articles at a release station as said turret and pickup heads continuously rotate said single turret axis.

Claim 105 (new). The apparatus of claim 103 wherein said pickup-head motion converter includes:

connector mechanisms interconnected between said rotating turret and said pickup heads for imparting swivel and translatory motion to said pickup heads on said frames.

Claim 106 (new). The apparatus of claim 105 wherein said connector mechanisms include vertical cam shafts, articulating linkage arrangements connected between said transfer shafts and said pickup heads for imparting said motion to said pickup heads; and said linkage arrangements being slidably carried by said cam shafts to slide up and down as said pickup heads reciprocate vertically during pick up and release of the articles while carried by said turret.

Claim 107 (new). The apparatus of claim 106 including cam followers connected to said articulating linkage arrangements, and at least one cam mounted to a stationary support disposed inwardly of said turret, and said cam followers engage said cam to impart said motion to said pickup heads.

Claim 108 (new). The apparatus of claim 103 wherein said pickup heads include a plurality of article gripper elements for gripping the articles arranged in a matrix corresponding to an array of the articles to be picked up, and including;

a pickup head actuator mechanism for actuating said gripper elements to grip and release the articles;

a plurality of grid heads having pivoting grid fingers arranged in a grid array corresponding to an array of the articles to be picked up, said grid fingers defining grid chutes having upper ends and lower ends for receiving the articles; said grid heads being carried by said transfer arms in alignment with said pickup heads; and said pickup

heads having an array of article gripper elements arranged in a matrix corresponding to the array of grid chutes for gripping the articles; and

said grid chutes have an open chute position wherein said lower chute ends are open for receiving the articles, said vertical motion mechanism is operatively connected to said grid heads for lowering said grid heads over the articles in said open chute position; said grid fingers having a closed position with the articles being held generally in said chutes, and including a grid actuator operatively associated with said grid fingers to cause said grid fingers to move between said open and said closed positions.

Claim 109 (new). The apparatus of claim 108 wherein said grid finger actuator includes a profiled body carried with said gripper elements which engages said grid fingers during relative movements between said grid heads and pickup heads to move said grid fingers to said open position and provide said open chutes for receiving the articles.

Claim 110 (new). A method of continuously transferring articles between a pickup station and a release station comprising:

feeding a plurality of articles along a linear path through a pickup station;

conveying cases along a case transport path;

providing a plurality of pickup heads arranged in a circle to rotate about a single vertical axis along a main radial path;

providing a release station along said main radial path where the articles are released and deposited after pickup;

rotating pickup heads about the central axis along the radial path while causing the pickup heads to depart from the radial path; swiveling the pickup heads about a

secondary swivel axis after departure from the radial path to move in a straight line path through the article pickup station;

returning the pickup heads to the radial path after passing through the pickup station;

causing said pickup heads to move without swiveling along the main radial path; and

releasing the articles at the release station along the radial path.

Claim 111 (new). The method of claim 110 including providing a rotating turret carrying said pickup heads for rotation along said main radial path; providing linkage mechanisms connected between said turret and said pickup heads; and swiveling the pickup heads about their secondary swivel axis by actuating said linkage mechanisms through the pickup station.

Claim 112 (new). The method of claim 111 including swiveling said pickup heads about the secondary swivel axis to move the pickup heads in rotary and transitory motions through the pickup station to effect said straight-line path.

Claim 113 (new). The method of claim 110 including conveying cases on said case conveyor having a common case support.

Claim 114 (new). The method of claim 113 including conveying said cases generally and without change in the direction of the cases relative to the transport surface.

Claim 115 (new). The method of claim 113 including maintaining the pickup heads in a stationary position generally without changing orientation along the main

radial path whereby the positions of the cases and pickup heads relative to each other remain constant without changing their orientation along the main radial path.

Claim 116 (new). The method of claim 110 including conveying said articles in a linear path through the pickup station; transporting the cases along the radial path on a common transport surface generally without change in orientation on the transport surface along the radial path; and rotating the pickup heads along the main radial path generally without a change in direction of the pickup heads moving along the radial path.

Claim 117 (new). The method of claim 110 including providing a plurality of grid heads having grid fingers defining chutes through which the articles pass during pickup and release; carrying said grid heads for rotation along the main radial path wherein each pickup head is vertically aligned with a grid head whereby the pickup heads and grid heads are aligned with a group of the articles required to be picked up and released.

Claim 118 (new). The method of claim 117 including rotating the pickup heads and grid heads along the main radial path, and moving the pickup heads and grid heads along the straight-line path by swiveling the pickup heads and grid heads about the secondary swivel axis, and returning the pickup heads and grid heads to the main radial path after passing through the pickup station where the pickup heads and grid heads move along the main radial path without swiveling.

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Remarks

Applicant requests entry of new claims 76-118 for examination in the application.

Respectfully submitted,



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